

## Department Announcement System Using Arduino

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### ABSTRACT

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In nowadays we need to stay connected. In most of the college's, announcements are seen under the major problem. A universal announcement by speakers is usually deployed in most of the institutes, but there are cases when the announcement must be for specific classroom or for a specific person. There in case, such a universal system won't be helpful. Talking of colleges, the scenario in the classroom currently involves communicating facilities. The communication is generally using a student address system accessible from the control room only. This system removes a delay in case of emergency or even when an urgent communication is to be made. The proposed system aims to connect the communication between HODS or an authorized person of the department to the students or workstation, thereby ensuring good communication. We can achieve this using NRF24L01 Antenna Wireless Transceiver, Arduino NANA, Sound detection sensor module and speakers.

**Keywords :** NRF24L01 Antenna Wireless Transceiver, Arduino NANA, Sound detection sensor.

### I. INTRODUCTION

The systems today offer communication facilities of the work place to make general announcements which can be access from one fixed location. so our aim is to connect the communication between authorized person of the department to the students, thereby ensuring the good communication. The proposed system aims to connect the communication between HODS or an authorized person of the

department to the students or workstation, thereby ensuring good communication.

Talking of colleges, the scenario in class room currently involves communicating facilities. The communication is generally using a student address system accessible from the control room only. This universal addressing system inherits a delay in case of emergency or even when an urgent communication is to be made. So due to the need to stay connected we need more efficient systems that can announce over a

large range. This proposed system can be employed in many applications like educational, institutions, organizations, traffic, management, railways, announcements, advertisements, large industries, etc. Being a user friendly, long range and fast product means conveying information are major strengths of this application.

## II. LITERATURE SURVEY

In order to design and develop Departmental announcement system for college or school extensive research on the microcontrollers, relays, driver IC's, transmitters, receivers and radio frequency need to be fulfilled. This section will discuss previous studies that have been accomplished by other researchers in the same area. "International Journal of Control, Automation, Communication and Systems (IJCACS), Vol.1, No.2, April 2016" it help us more details of Arduino microcontroller and its pin configuration and some programming knowledge about Arduino microcontrollers. "IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 12, 2016 ISSN (online): 2321-0613" in this Journal we have learnt about function of relay and relay drivers and its present applications like switch. "Wireless Sensor Network, 2012, 4, 173-176 A 2.4-GHz-Low-Power CMOS RF Transmitter for IEEE 802.15.4 Standard" in this Journal we learnt how the 2.4 GHz RF transmitter works. Its applications and resultant graphs. "International Journal of Scientific Research in Electronic and communication Engineering© 2017 IJSRCSEIT | Volume 2 | Issue 1 | ISSN: 2456-3307" this Journal help us to study about the basic principle of RF receivers and output graphs. And many more application "RF Based Wireless Data Transmission between Two FPGAs by Jaydeep Russia Department of Electronics and Telecommunication National Institute of Technology Raipur, Chhattisgarh" this Journal help us to see how the working principle of RF transmitter and receivers modules with example of transferring data between two FPGAs.

## III. SYSTEM REQUIREMENTS

### Hardware Components:

1. NRF24L01 Antenna Wireless Transceiver.
2. Adapter Board for 24L01 Wireless Module.
3. ARDUINO NANO.
4. MAX9814 MICROPHONE WITH AGC.
5. PAM8403 Module
6. Speaker
7. Push button

### Software Requirements:

1. Arduino IDE
2. Arduino C
3. NRF Libraries
4. RF Audio Library

### 2.1.NRF24L01+PA+LNA module



Fig 2.1: NRF24L01+PA+LNA

The nRF24l01 module is the RF module. the module uses the 2.4GHz transceiver. The transceiver IC works in the 2.4GHz band and has new features. This board features a reverse polarized SMA connector for max RF range. There is PA and LNA circuit on board, with the external ducky antenna it will reach a long distance than the one without ducky antenna these parts. This module comes with a 250Kbps transmission rate outdoors it'll reach the 800- 1K meters communication distance.

### Features of NRF24L01+PA+LNA module

- It uses 2.4GHz global open ISM band, with license-free.
- Transmit power is larger than +20 dBm.
- 2Mbit/s speed makes high-quality VoIP possible
- Maximum Pipelines/node - 6
- Low cost.
- SPI interface facilitates communication with MCU I/O port.

### 2.2. Adapter Board for nrf24l01 Wireless Module

This is an adapter board for the nrf24l01 wireless Transceiver module. enables you to uses NRF24l01 type transceivers on 5V systems like Arduino nano. It regulates the 5voltage input to 1.9~3.6 voltage.

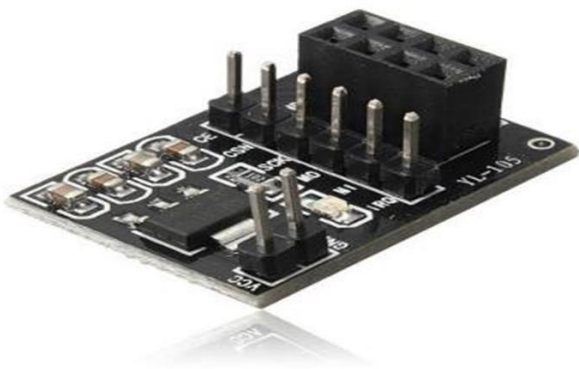


Fig 2.2: Adapter board for NRF24L01+PA+LNA

### Features of Adapter Board for NRF24L01 Wireless Module

- The adapter board is easy to use with modules like nrf24L01.
- The input voltage is given to the adapter board is 4.5v to 12 volts.
- It regulates the input voltage to 1.9~3.6 voltage.
- it has a built-in small led indicator to shows the correct connection of the power supply.

### 2.3. Arduino NANO

The smallest Embedded Development board is named by Arduino nano version 3. It was introduced by Arduino based on Atmega328 SMD Package Microcontroller. In this board, power jack is not

available. Using mini-USB cable the power can be given to the board.

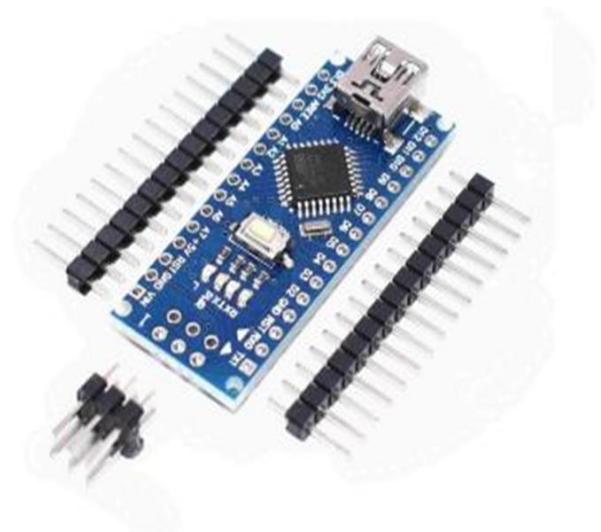


Fig 2.3: Arduino Nano

### FEATURES OF ARDUINO NANO:

- Microcontroller Atmel ATmega328 SMD Package
- 5 V Operating Voltage (logic level).
- 7-12 V Input Voltage (recommended).
- 6-20 V Input Voltage (limits).
- Digital input and output pins are 14.
- Pin 8 Analog Input.
- DC Current per I/O Pin 40 mA.
- 32 kilobytes of Flash Memory.
- 2 KB SRAM.
- 1 KB EEPROM.16 MHz Clock Speed.

### 2.4. SOUND DETECTION SENSOR MODULE

The sound detection sensor module detects the sound intensity. where sound is detected via a microphone and given to an LM393 op-amp. It will compare with an onboard potentiometer to setpoint for sound level.

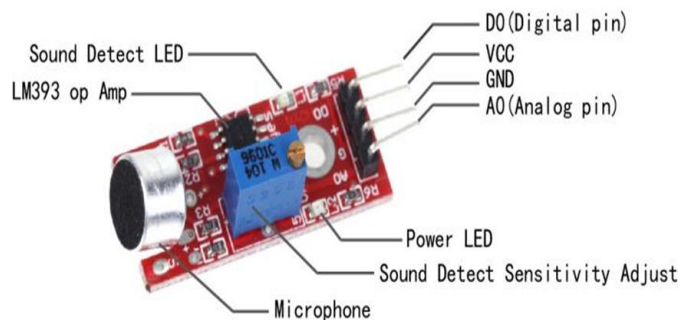


Fig 2.4: Sound detection sensor module

## Sound Detection Sensor Module Features & Specifications

- Voltage: 3.3V to 5V DC.
- LM393 comparator with threshold preset
- Size of PCB: 3.4cm \* 1.6cm.
- Distance of Induction: 0.5 Meter.
- Adjusting current: 4~5 mA.
- Microphone Sensitivity (1kHz): 52 to 48 dB.
- Sensor module can easily used with Digital/Analog IC or with Microcontrollers
- It is Small, cheap and can be easily used.

## 2.5. PAM8403 Module

PAM8403 is the amplifier board this board uses 5v input voltage and will derive two 3watt stereo speakers. Class D stereo amplifier in Small board space. The amplifier is used by the user to get or attain high-quality audio reproduction to the stereo input additionally. it's special features that are, it can drive speakers directly from its output. For portable applications, it'll be suited.



Fig 2.5: PAM8403

### Features of PAM8403 Module:

- Dual-channel stereo output 2\* 3-watt speakers.
- Operating voltage: Wide range supply ranges from 2.5v to 5.5vDC.
- 85% efficiency of High amplification.
- It can directly drive 4 Ohm/8 Ohm small speakers. It has Good sound quality & noise suppression.
- Operating temp: -40 to 85 degrees Celsius.
- Dimension in cm 2.11\*1.85.
- Short circuit protection.

- Thermal shutdown. Dual-channel with high output power.

## 2.6. SPEAKER - 4 Ohm 3 Watt

PAM8401 module is connected with the output voice of the speaker. Actually, the speaker is rated by 4 Ohms and three watts. the specification is discussed below.



Fig 2.6: Speaker

### FEATURES OF SPEAKER - 4 Ohm 3 Watt

- Nominal Size: 20 mm
- Impedance: 4 Ohm  $\pm$  15% at 1 KHZ 1V
- Frequency: 750 Hz  $\pm$  150 Hz at 1V
- Sound level: 86 dB/w  $\pm$  3 dB
- Response: 10 dB (max)
- Input power: 0.5W

## 2.7. PUSH BUTTON



Fig 2.7: Push button

Push-Buttons are normally open tactile switches. Simply, it makes the circuit close when pressed and it opens the circuit when it releases.



#### IV. METHODOLOGY

Our motto is to develop an announcement system from HOD's cabinet to class rooms. The entire project is divide by two part the first part explains about process in HOD's cabinet or staff room. And second part is explained about process in class room.

##### 4.1 Process in staff room:

The working procedure of our project is starts from respective class push to talk button. Using push button the user can give announcement the message to classes. When the user click the respective class button in the key board the signal is went to the microcontroller and microcontroller switch the respective nrf24l01 module to transmitter to transmit the audio signal to respective class receiver.

For an input audio signal we use a mic which is connected to amplifier. Because the audio captured by the mic and the voltage of captured voice is too low to send or increase the voltage of captured audio signal we use sound sensor built in amplifier. The sound sensor take the audio signal and amplified to desired value of voltage for wireless propagation. The amplified voice or audio signal is given to microcotroller to transmit the signal from the nrf24l01 module to transmit the audio signal to respective class room.

##### 4.2 Process in class room

In class room we arrange the respective nrf24l01 module to receiver or collect the transmitted audio signal from the staff room and connected to microcontroller the microcontroller collect the signal from spi pins of microcontroller.

The microcontroller is connected to pam8403 amplifier circuit this circuit is responsible for The amplify the signal.this signal is given to a speaker for output voice.

#### 4.3 BLOCK DIAGRAM

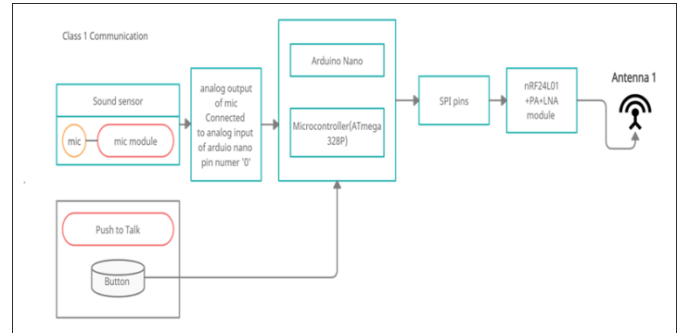


Fig 4.1: Block diagram process in staff room

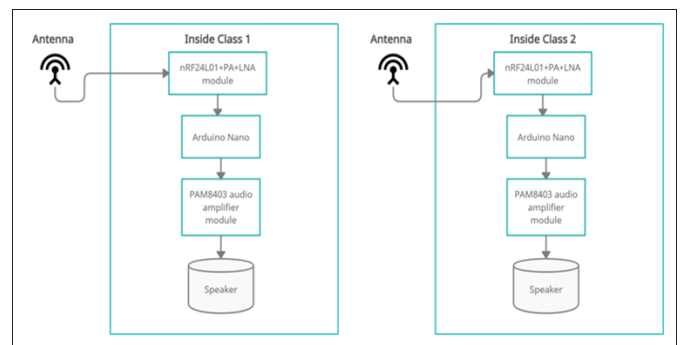


Fig 4.2: Block diagram process in class room

#### V. CIRCUIT DIAGRAMS

##### 5.1. Circuit diagrams for transmitter

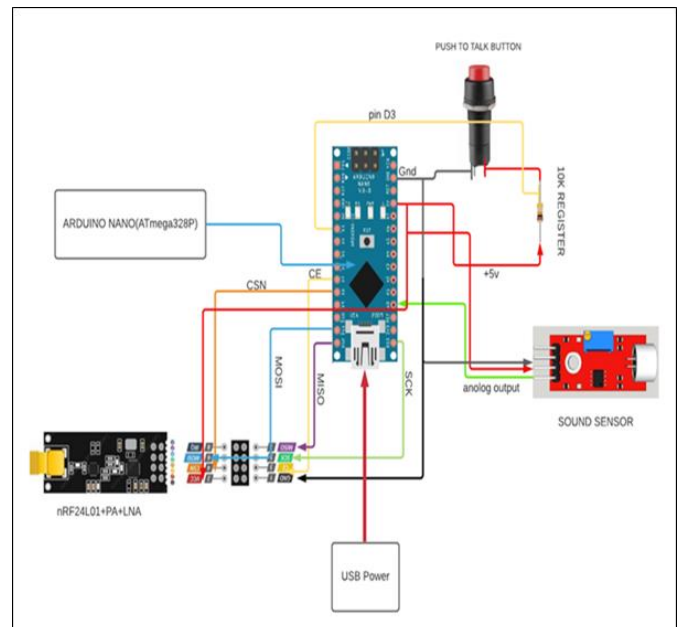


Fig 5.1: Circuit diagram for transmitter

### Steps to connect the components for transmitter circuit (staff room circuit)

- Connect the spi pins of nrf24l01 pins to Arduino nano
- CE (chip enable) to digital pin 7
- CSN pin to digital pin 8
- SCK pin to digital pin 13
- MOSI pin to digital pin 11
- MISO pin to digital pin 12
- After doing the connection of nRF24l01 module next we connect the microphone module
- The 5V VCC and ground is given to the microphone module and its analog output pin is given to analog input pin A0 in Arduino nano
- To transmit the audio signal from mic module we need a interrupt. To create the interrupter, we impalement a push button.
- The output of the push button is given to digital pin 3.
- So, when we press the push button the nRF24L01 module start transmitting the audio signals from mic.

### 5.2. Circuit diagrams for receiver

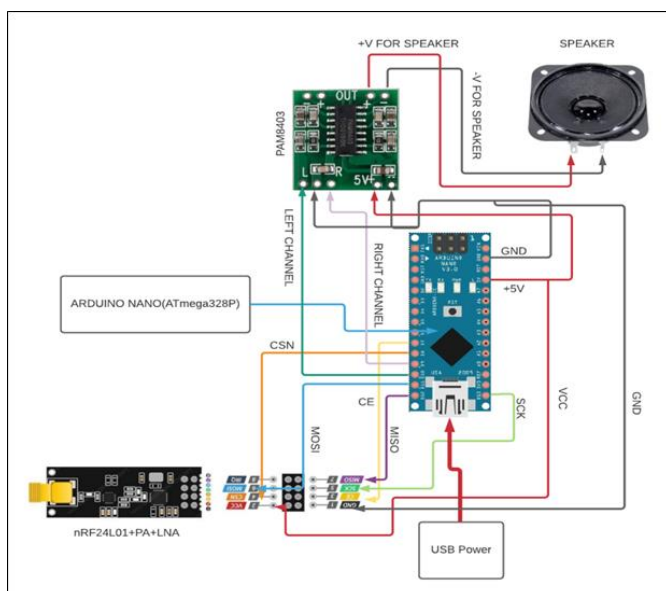


Fig 5.2: Circuit diagram for Receiver

### Steps to connect the components for Receiver circuit (class room circuit).

- Connect the spi pins of nrf24l01 pins to Arduino nano
- CE (chip enable) to digital pin 7
- CSN pin to digital pin 8
- SCK pin to digital pin 13
- MOSI pin to digital pin 11
- MISO pin to digital pin 12
- The nrf24l01 module is in receiver mode to receive the signal from the staff room.
- The output signal of the Arduino is two low so we use a audio amplifier called PAM8403 module.
- PAM8403 the power pins are connected to 5V VCC and ground the left audio pin is connected to digital pin 10, and right audio pin is connected to digital pin 9.
- The output of PAM8403 is connected to speaker.

## VI. RESULTS

The outcome of our project is whenever the user presses the class key or a push button. The microphone switches the corresponding wireless communication circuit(nrf24l01) to transmitter mode on to communicate the class room. Then the transmitter can transmit the audio signal and need to reach the destination class room receiver and the receiver need to collect the audio signal coming from the staff room and give to microcontroller. This microcontroller is connected to pam8403 amplifier this circuit is responsible for amplification of received signal so the received signal is given to the speaker for output voice.

## VII.CONCLUSION

The prototype of the project entitled “Department announcement system” is expected to work efficiently. It has been developed by integrating the components of system. The system is showed in the block diagram. Presence of every component and modules been

reasoned and placed carefully, thus contributing to the best work of the unit. The transmitters and receivers can do the function perfectly. The transmitter in the staff room can send the audio signal properly. the receiver in the class room can receive the audio signal properly and the voice can clear and loud from the output receiver speaker in class room

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